A Guide to Oral Health
For
Non-Dental Health Providers

by

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Contents

Introduction

Three of the most important skills of a good health care clinician are listening, communicating and caring. Interest in the last of these is demonstrated by interest in broadening one's scope of knowledge.

"Too little time is devoted to oral health and disease topics in the education of non-dental health professionals. Yet all care providers can and should contribute to enhancing oral health. This can be accomplished in several ways, such as including an oral examination as part of a general medical examination, advising patients in matters of diet and tobacco cessation, and referring patients to oral health practitioners for care prior to medical or surgical treatments that can damage oral tissues, such as cancer chemotherapy or radiation to the head and neck. Health care providers should be ready, willing, and able to work in collaboration to provide optimal health care for their patients. Having informed health care professionals will ensure that the public using the health care system will benefit from interdisciplinary services and comprehensive care. To prepare providers for such a role will involve, among other factors, curriculum changes and multidisciplinary training." (Oral Health in America: A Report of the Surgeon General, 2000)

Few medical school curriculums contain any information about the mouth, teeth and their supporting structures. It is recognized that total health may not be achieved without good oral health. Numerous recent studies have linked oral infection with low birth weight premature infants and cardiac disease. A healthy oral cavity is particularly important for HIV infected patients so they may receive adequate nutrition and not place additional stress on their immune system from oral infection.

All clinicians should have a rudimentary ability to recognize deviations from the normal. Unless a nondental health provider has the diagnostic skill to rule out dental infection, all swelling related to the jaws should be managed in consultation with a dentist. Two physicians one of whom was an otolarngologist treated a recent case of a swelling of the facial surface of the mandible. They suspected the patient had lymphoma or Ewing's sarcoma. Several months, three CT scans, two biopsies, and antibiotic therapy later, they arrived at the diagnosis of osteomyelitis. The patient was referred for a dental panographic radiograph at this point. The radiograph revealed extensive caries involvement in the mandibular second molar and a periapical abscess on both the first and second molars. Endodontic therapy or extraction of the involved teeth would have very simply resolved the problem. Not only did the patient not receive optimum care but the cost of two CT scans let alone the other treatment would have covered the cost of a root canals and crown restorations.

"The mouth is a readily accessible and visible part of the body and provides health care providers and individuals with a window on their general health status. As the gateway of the body, the mouth senses and responds to the external world and at the same time reflects what is happening deep inside the body. The mouth may show signs of nutritional deficiencies and serve as an early warning system for diseases such as HIV

infection and other immune system problems. The mouth can also show signs of general infection and stress. As the number of substances that can be reliably measured in saliva increases, it may well become the diagnostic fluid of choice, enabling the diagnosis of specific disease as well as the measurement of the concentration of a variety of drugs, hormones, and other molecules of interest. Cells and fluid in the mouth may also be used for genetic analysis to help uncover risks for disease and predict outcome of medical treatments." (Oral Health in America: A report of the Surgeon General, 2000)

Cooperation is needed between all health specialties and the dental clinician to provide optimum care for patients. It is hoped this guide for non-dental health care providers will aid them in communicating with dentists in order to achieve a dialogue resulting in better patient care.

SECTION I

An Outline for Oral Disease and Its Management

WHAT IS ORAL DISEASE?

BACKGROUND

A. Dental Caries

Dental caries is a common chronic dental disease in children and adults. It is the most common chronic disease in children.

Dental caries is an infectious, transmissible, and diet-dependent disease.

Streptococcus mutans is the primary organism responsible for caries. This bacterium is transmissible, i.e. to infant from parent or caregiver.

Risk assessment for caries should begin by six months of age by a qualified pediatric health care provider.

Early intervention may prevent or diminish the severity dental caries.

B. Periodontal Disease

Periodontal disease is an infection of the supporting structures of teeth.

Calculus (tartar) is a hard deposit that accumulates on teeth and prostheses. Calculus is a frequent promoter of periodontal disease which develops from precipitation of calcium compounds from the saliva into the plaque.

Calculus deposits can be prevented through thorough removal of dental plaque.

Periodontal disease causes loss of support from gingiva and bone resulting in loosening of the teeth and eventual tooth loss.

Periodontal disease is associated with systemic medical conditions, such as diabetes, premature low birth weight infants, and heart disease.

C. Oral Cancer

Smoking (cigarettes, pipe, or cigar), especially when combined with heavy alcohol consumption (30 or more drinks per week), increases risk for oral cancer.

Excessive exposure to sunlight increases risk of oral cancer.

Individuals with HIV infection are at greater risk for Kaposi's sarcoma, and Non-Hodgkin's lymphoma.

Using smokeless tobacco and betel nuts increases the risk of oral cancer.

D. Trauma

Whenever a tooth sustains trauma, there is the potential for future necrosis of the dental pulp. Intraoral radiographs of traumatized teeth should be taken as a base line for future reference. Additionally, periodic vitality testing should be conducted on the traumatized teeth. The more rapidly dental care is provided following trauma the more favorable the prognosis.

Dental pulp is not exposed (chipped teeth) – protect exposed dentine with dental cement or cyanoacrylate over the chipped area.

Dental pulp is exposed – pulp capping or endodontic treatment is needed. In the case of interdental fixation for jaw fractures, exposed pulps should be removed and the pulp canal temporarily sealed until fixation is removed.

Partially avulsed teeth – Partially avulsed teeth should be stabilized with flexible material such as light wire or heavy fish line attached to the teeth with composite resin. Stabilization should be removed in about four weeks.

Avulsed teeth – Completely avulsed teeth need to be re-implanted as rapidly as possible. Teeth remaining out of the socket more than **one hour** have greatly diminished positive outcomes. **Avulsed teeth need to be kept moist and root surfaces must not be scraped or rubbed.** Debris may be washed off. The tooth should be immediately re-implanted, kept in the buccal fold of the patient's mouth if the patient is capable without swallowing it or placed in milk to keep it hydrated. The tooth may be adjusted in alignment and then stabilized a for few hours following an accident. Flexible stabilization helps prevent ankylosis. This is **a true dental emergency** – prompt care increases a favorable prognosis.

SYSTEMIC PROBLEMS RELATED TO ORAL DISEASE

A. Cardiovascular disease

Studies from recent years show an association between heart disease and periodontal disease.[1]

Endocarditis [2,3]

High Risk for Endocarditis (prophylaxis recommended)

Prosthetic cardiac valves
Previous bacterial endocarditis
Complex cyanotic congenital heart disease (e.g., single ventricle states, transposition of the great arteries, tetrology of Fallot)
Surgically constructed systemic pulmonary shunts or conduits

Moderate Risk for Endocarditis (prophylaxis recommended)

Most other congenital cardiac malformations (other than above)

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[1] Okoro CA, Balluz LS, Ajani UA, Strine TW, Town M, Mensah GA, Mokdad AH. Tooth loss and heart disease findings from behavioral risk factors, Am J Prev Med, 29(Suppl 1):50-56, 2005.

[2] Guntheroth WG. How Important Are Dental Procedures As a Cause of Infective Endocarditis?, *Am J Cardiol* 54:797-801, 1984.

[3] Dajani AS, et al. Prevention of Bacterial Endocarditis: Recommendations by the American Heart Association, *JADA* 128:1142-1151, 1997.

Acquired valve dysfunction (e.g., rheumatic heart disease)
Hypertrophic cardiomyopathy
Mitral valve prolaspe with valvar regurgitations and/or thickened leaflets

Low Risk for Endocarditis (prophylaxis not recommended)

Isolated secundrum atrial septal defect
Surgical repair of atrial septal defect, vental septal defect or patent ductus arteriosus
Previous coronary artery bypass graft surgery
Mitral valve prolapse without regurgitation
Physiologic, functional or innocent heart murmurs
Previous Kawasaki disease without valvar dysfunction
Previous rheumatic fever without valvar dysfunction
Cardiac pacemakers and implanted defibrillators

Dental Procedures for Which Prophylaxis is Recommended

Dental extraction
Periodontal procedures including surgery, scaling and root planning, probing and recall maintenance
Dental implant placement and re-implantation of avulsed teeth
Endodontic instrumentation or surgery only beyond the apex of tooth
Subgingival placement of antibiotic fibers or strips
Initial placement of orthodontic bands but not brackets
Intraligmentary local anesthetic injections
Prophylactic cleaning or teeth or implants where bleeding is anticipated

Dental Procedures for Which Prophylaxis is Not Recommended

Restorative dentistry (no retraction chord)
Local anesthetic injections (non-interligamentary)
Intracanal endodontic treatment: post placement and buildup
Placement of rubber dams
Placement of removable prosthetic or orthodontic appliances
Taking impressions
Fluoride treatments
Taking intraoral radiographs
Orthodontic appliance adjustment
Shedding of primary teeth

Prophylaxis Regimens For Prevention of Endocarditis

Standard Regimen	amoxicillin	Adults: 2.0 g; Children 50 mg/kg: Orally 1 hour before procedure
Allergic to penicillin	clindamycin	Adults:600 mg

	Or chelexin or cefadroxil Or azithromycin or clarithromycin	Children: 20 mg/kg Orally 1 hour before procedure Adults: 2.0g Children: 50 mg/kg Orally 1 hour before procedure Adults: 500 mg Children: 15 mg/kg Orally 1 hour before procedure
Allergic to penicillin and unable to take oral medications	clindamycin Or cefozolin	Adults: 600 mg Children: 20 mg/kg IM or IV within 30 minutes before procedure Adults: 1.0 g Children: 25 mg/kg IM or IV within 30 minutes before procedure

B. Diabetes

Diabetes is a risk factor for the development of periodontal disease.

Diabetics have a higher incidence of periodontal disease.[4]

Diabetics may find it more difficult to maintain control of their diabetes in the presence of infection.[5]

C. Eating Disorders

Enamel may be eroded on the teeth of individuals who are bulimic. Highly acidic vomitus will dissolve the enamel, particularly the lingual and occlusal surfaces of the teeth with repeated exposure.

D. Medications Affecting the Oral Cavity

Medications with Adverse Oral Complications

[4] Shlossman M, Knwer WC, Pettitt DJ, and Genco RJ. Type 2 diabetes mellitus and periodontal disease, JADA 121:532-536, Oct 1990.

[5] U.S. Department of Health and Human Services. Periodontal Disease and Diabetes: A Guide for Patients, NIH Publication No. 87-2946, September 1987.

Side Effects Associated with Appropriate Drug Use

Anticoagulants/Aspirin/NSAIDS	Post-surgical clotting
Systemic antibiotics/oral or inhaled corticosteriods	Fungal infections
Anticonvulsants	Gingival hyperplasia
Antibiotics/candida infection/smoking	Hairy tongue
Prolonged use of chewable aspirin or vitamin-C	Enamel erosion
Antihistamines/neuoleptics/antidpressants/clonidine/ anti-emetics/anti-arrhythmics/Flexeril	Xerostomia
Drug hypersensitivity to antibiotics/local anesthetics/dentifrices/mouthwashes/medicated lozenges/Feldine	Topical reactions (Stomatitis)
Corticosteroids/phenothiazines/antineoplastics/Nicorette gum	Mucosal ulcerations
Extrapyramidal symptoms	neuroleptics

Side Effects Associated with Inappropriate Drug Use

Aspirin	Mucosal ulceration
Vitamin-C	Mucosal ulceration
Tetracycline	Yellowish or brownish-gray staining of developing teeth

Medications Related to Oral Movement Disorders[6]

Antidepressants	amoxapine
Anti Parkinson	levodopa
Anti psychological agents	acetophenazine chlorpromazine clozapine fluphenazine haloperidol loxapine mesoridazine perphenazine

[6] American Dental Association. Dental Therapeutics. R.R.Donnelley & Sons Co., Chicago, 2nd Ed., 2000, p. 514.

	prochlorperazine promazine thioridazine tridluroperazine

[7]

LOW BIRTH-WEIGHT PREMATURE INFANTS

The risk for premature low birth-weight infants is increased in women who have periodontal disease.

Dental Management of the Pregnant Patient

Pregnancy

"Although definitely not a disease, poses a unique set of circumstances and necessary precautions for the dentist. The hormonal and anatomic change produce effects that must be accounted for in providing dental care. As pregnancy is a transitory state, many elective dental procedures can be scheduled for completion after the baby is born. Pregnancy, however, does present the potential for dental problems that will require preventive strategies or actual treatment during pregnancy. Many medications commonly used in dentistry are acceptable for use by pregnant patients, particularly in the last two trimesters, but care must be exercised in their selection."[8]

Taking radiographs is permissible with no danger as long as leaded barrier apron is used. The National council on Radiation Protection proposes that oral radiographic examination is not contraindicated because of pregnancy.[9]

As a general rule:

1st Trimester avoid treatment
2nd Trimester routine treatment may be rendered
3rd Trimester emergency treatment for pain and infection (discomfort to patient from sitting)

FDA Classification of Selected Drugs Used During Pregnancy[10]

Aspirin	D
NSAIDS mefenamic acid	C

[7] American Dental Association. Dental Therapeutics, 2nd Ed. ADA Publishing Co., Chicago, 2000, p.514.
[8] Rothwell BR, Gregory CEB and Sheller B. The pregnant patient; consideration in dental care, Special Care Dent 7(3):124-129, 1987.
[9] White SC, Pharoah MJ. Oral Radiology, 5th Ed., Mosby, St. Louis, 2004, p. 61.
[10] American Dental Association. Dental Therapeutics, R.R.Donnelley & Sons Co., Chicago, 2nd Ed., 2000, p.594-595.

etodolac	C
ketotolac	C
flurbiprofen	B
ibuprofen	Not established
naproxen	B
difluinsal	C
Opioids	C
Acetaminophen	B
Local anesthetics	
bupivacaine	C
artcaine	B
lidocaine	B
mepivacaine	C
prilocaine	B
Anitbiotics	
penicillin	B
clidamycin	B
cephalosporins	B
macrolides	B (except clarithromycin C)
tetracyclines	D

MEDICALLY COMPROMISED PATIENTS

A. Artificial Joints

It appears the most critical period for infection of total joint replacements is up to two years following placement. "It is likely that many more oral bacteremias may occur in the course of normal daily life and concurrently with dental and medical procedures. Presently, no scientific evidence supports the position that antibiotic prophylaxis to prevent hematogenous infections is required prior to dental treatment in patients with total joint prostheses."[11]

Antibiotic prophylaxis may be considered in patients at potentially increased risk of hematogenous infections.

Patients at Increased Potential Risk for Hematogenous Infections[12]

Immunocompromised/Immunosuppressed Patients	Inflammatory arthropathies: Rheumatoid arthritis, Systemic lupus

[11] Ibid. p.600-603.

[12] Wynn RL, Meiller TF, Crossley HL. Drug *Information Handbook for Dentistry,* 9th Ed. Lexcomp Inc., Hudson, 2003, p.1511-1513.

	erythematosus Disease, drug or radiation induced immunosuppression
Other patients	Insulin-dependent (Type1) diabetes First 2 years following joint placement Previous prosthetic joint infection Malnourishment Hemophilia

Dental Procedures With Potential for Risk of Bacteremia

Higher incidence	Dental extractions Periodontal procedures Dental implant placement or reimplantation of avulsed teeth Endodontic procedures beyond the apex of the tooth Initial placement of orthodontic bands but not brackets Intraligamental local anesthetic injections Prophylactic cleaning of teeth or implants where bleeding is anticipated

Lower incidence	Restorative dentistry Local anesthetic injections Intracanal endodontic treatment Placement of rubber dam Postoperative suture removal Placement of removable prosthetic appliances Taking oral impressions Fluoride treatments Taking oral radiographs Orthodontic appliance adjustments

B. Anticoagulant Therapy

Safe Dental Treatment for Patients Receiving Coumadin Anticoagulant Therapy[13, 14, 15]

Dental Treatment	INR
Examination, radiographs, study models	<3.5
Simple restorative dentistry, subgingival prophylaxis	<3.0
Complex restorations, scaling and root planning	<3.0 to 3.5
Simple extractions, curettage, gingivoplasty	<2.5 to 3.0
Multiple extractions, single bony impaction	<2.0 to 2.5
Gingivectomy, apicoectomy	1.5 to 2.0
Full-mouth or full arch extractions	<1.5

C. Radiation Therapy

Radiation therapy induces damage to normal tissues. Radiation in the oral region may result in:

- Mucositis
- Xerostomia
- Radiation caries
- Taste changes
- Trismus
- Osteoradionecrosis

Management of radiation patients:

- Refer for dental evaluation before radiation therapy.
- Treat dental problems to remove potential sources of infection.
- Educate in oral preventive measures.
- Construct fluoride trays for topical fluoride therapy.
- Refer for palative dental treatment.

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[13] Herman WW, Konzelman JL and Sutley SH. Current Perspectives on Dental Patients Receiving Coumarin Anticoagulant Therapy, *JADA* 128:327-335. 1997.

[14] Aldous JA and Olson CJ. Managing patients on warfarin therapy: a case report, *Special Care Dentistry*, 21:109-112, 2001.

[15] Jeske AH and Suchlo GD. Lack of a scientific basis for routine dicontinuation of oral anticoagulation therapy before dental treatment, *JADA* 134:1492-1497, 2003.

D. Bisphosphonate Therapy

Recently there have been reports of osteonecrosis following dental surgical procedures on patients who have been taking bisphosphonates for the treatment of osteoporosis or metastatic bone cancer.[16,17] Early papers reported cases involving only individuals taking parental bisphosphonates, but now cases have been reported from the use of oral bisphosphonates.[18,19] When bisphosphonates are to be prescribed for patients, it would be prudent to have a complete oral examination performed and all non-restorable teeth removed and all dental procedures completed before patients are started on bisphosphonate therapy. However, discontinuing the use of bisphosphonates before dental procedures would be of little value because of the extended half-life of the medication.[20]

E. Chemotherapy

Chemotherapy patients have increased susceptibility to infection. The oral cavity may be a significant source of infection from mucositis or from infections of the teeth or supporting structures.

Management of chemotherapy patients:

- Refer for dental evaluation before chemotherapy.
- Treat dental problems to remove potential sources of infection.
- Remove potential problems that might require invasive dental procedures.
- Educate in oral preventive measures.

F. Geriatric Patients Issues

Arthritis

- Limits ability to perform adequate oral hygiene.
- May limit opening of the mouth.
- May limit accessibility to dental care.

Alzheimer's Disease

- Compromises ability to perform oral hygiene.
- May limit accessibility to dental care.
- Individuals may not tolerate prosthetic appliances.

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[16] Bamias A, Kastriitis B, Moulopoulos LA, Bozas G, Koutsokou V, et al. J Clin Oncol 23(34):8580-7, 2005.

[17] Lenz JH, Steiner, Krammer B, Schmidt W, Fietkau R, Mueller PC, Grundlack KK. Does avascular necrosis of the jaws incancer patients only occur following treatment with bisphosphonates? J Craniomaxillofac Surg, 33(6):395-403, 2005.

[18] Med Lett Drugs Ther, 47(1207):33-35, Apr. 25, 2005.

[19] Marx RE, Sawatari Y, Fortin M, Broumand V. Bisphosphonate-induced exposed bone (osteonecrosis/osteopetrosis) of the jaws: risk factors, recognition, prevention, and treatment, J Oral Maxillofac Surg 63(11):1567-75, 2005.

[20] Woo SB, Hellstein JW, Kalmar JR. Systematic Review: Bisphosphonates and Osteonecrosis of the Jaws, Ann Intern Med 144(10):753-761, 2006.

Oral Cancer

90% of oral cancer occurs in people over age 45.

Dental Caries

Gingival recession exposes root surfaces that are more susceptible to caries.

Age decreases salivary flow increasing risk of caries.

Decreased ability to perform oral hygiene increases the risk of caries.

Diabetes

Diagnosing and treating oral infection helps control diabetes.

Diabetes increases risk of gum disease and dental caries.

Hypertension

Many medications to control hypertension decrease flow of saliva. Dry mouth increases risk for gun disease and dental caries.

Stroke

May limit ability to perform adequate oral hygiene.

If facial muscles are affected, may have repeated biting of tongue and cheeks and difficulty in removing food from affected side of cheeks.

May make wearing dentures difficult or impossible.

May limit accessibility to oral health care.

Visual Changes

Patients may not recognize that they are inadequately performing oral hygiene.

May limit accessibility to oral health care.

Xerostomia

Over 250 medications have the potential to diminish salivary flow.

Individuals over 65 take more medications than the younger population.

ACUTE DENTAL ABSCESSES

Dental abscesses are of two origins or combination of the two.

Periapical abscess is the result of necrosis of the dental pulp either from trauma, chronic pulpal irritation, or caries.

Periodontal abscesses are the result of infected periodontal pockets from advanced periodontal disease.

Combination of periodontal and periapical abscesses are the result of extensive periodontal disease that reaches and infects the dental pulp.

Treatment for dental abscesses

Treatment consists of removal of the source of infection or draining the infection either by endodontic (root canal) procedures or removal of the tooth. Incision and drainage of soft tissue is seldom necessary or advised. Antibiotic therapy is advised when there are systemic symptoms or extreme swelling associated with the problem.

ORAL EXAMINATION

A. Examining children beginning at one year of age*

Good light - essential for an adequate oral examination.
Look for plaque and caries.
Look for early caries that may be manifested as chalky white spots or various shades of brown with or without a break in the surface of the tooth. Caries may vary from stained pits and groves to complete destruction of the entire crown of the tooth.

* When examining infants position parent and health care worker in a seated knee to knee position and place child's head in the lap of the health care provider.

B. Examining older Children and Adults

Remove any oral appliances or removable prosthesis.
Observe the outside of mouth – eyes, face lips.
Observe the inside of lips, cheeks, and buccal mucosa.
Observe the tongue, tongue side of gingiva, and floor of mouth.
Observe the teeth for caries, restorations, missing teeth, and bite.
Look for lesions, ulcers, swellings, masses, color changes.
Feel and listen to the temporomandibular joint.
Confirm by radiograph missing teeth to determine if they are missing or un-erupted.

C. Examine for Periodontal Disease

Signs and Symptoms
Gingivitis – red, swollen, and/or bleeding gingiva
Malodor
Calculus
Periodontal Pockets (deep space between teeth and gingival)
Mobility of teeth

D. Examine for Orthodontic Problems

Signs and Symptoms of malocclusion
Profile
- Class I – normal
- Class II – receding mandible
- Class III – protruding mandible

Malposed teeth
Crowded teeth – insufficient arch space or possible supernumerary teeth
Abnormal space between teeth – impacted teeth, periodontal disease, abnormal jaw growth (acromegaly, fibrous dysplasia)
Misaligned and missing teeth – tumors, congenital craniofacial abnormalities, Job's syndrome, Treacher-Collins syndrome, cleidocranial dysostosis

E. Cancer screening

A thorough oral examination and palpation of lymph nodes is necessary to provide a good cancer screening. Suspicious signs include:

A mouth sore that fails to heal or that bleeds easily
A white or red patch in the mouth that will not go away
Any white or red lesion or condition that does not heal in two weeks
A lump, thickening, or soreness in the mouth, throat, or tongue
Difficulty chewing or swallowing food
Difficulty moving the jaw or tongue
Hoarseness
Numbness of the tongue of other areas of the mouth
Swelling of the jaw that causes dentures to fit poorly or become uncomfortable

F. Risk Assessment for Caries

Parent dental history – parents with caries or numerous fillings = ↑ child's risk of caries.
Sugar intake - ↑ sugar = ↑ caries
Order of children – later order of children = ↑ risk of caries
Oral hygiene – poor hygiene = ↑ risk of caries
Fluoride exposure – optimal fluoride = ↓ caries
Professional dental care – regular professional care = ↓ caries
Low socioeconomic status = ↑ caries

PREVENTION OF ORAL DISEASE

A. Tooth Brushing

Thorough brushing with fluoride toothpaste significantly reduces caries and periodontal disease.

Use soft bristle toothbrush with a pea size amount of fluoride tooth paste.
Electric tooth bushes are particularly advantageous for handicapped or geriatric patients who have difficulty holding or manipulating a toothbrush.
It is important to brush after breakfast, before going to bed, and after eating sweets.
Avoid brushing immediately after consuming acidic food and drinks, using a brush with hard bristles and using abrasive toothpaste.

B. Flossing

Brushing may clean as much as 85% of the surface of the tooth. Flossing provides a means to clean the remaining surfaces of the tooth. Complete cleaning cannot be accomplished without flossing. Dental floss is available in a variety of types (i.e. waxed, unwaxed, tape, thin, flavored).

Unwaxed floss may clean better but is harder to use. Select floss you are comfortable with. Flossing should be performed at least once a day.

Use the minimal length of floss between the fingers. A longer length may act as a bowstring as it passes through the contact causing bruising or cutting of the gingiva. By using a clean area on the floss and passing it several times over the surface to be cleaned, the plaque can be thoroughly removed.

C. Fluoride supplements

Fluoride is an essential component in prevention of dental caries. Fluoride may be utilized in several modalities: systemic fluoride through the water supply, oral systemic administration by drops or tablets, or topically by painting varnish, gels, toothpaste, and rinses. The most effective application of fluoride is through controlled community water supply supplementation.

Children living in areas without fluoride in the water supply should take a fluoride supplement from six months through age sixteen to increase resistance to caries.

Fluoride Supplementation Schedule

ADA Council on Scientific Affairs Recommendations for supplementation where water supplies are deficient in Fl.

AGE	Fluoride ion level in drinki ng water		
	<0.3 ppm	0.3-0.6 ppm	>0.6 ppm
Birth - 6 months	None	None	None
6 months - 3 years	0.25 mg/day	None	None
3 - 6 years	0.50 mg/day	0.25 mg/day	None
6 - 16 years	1.0 mg/day	0.50 mg/day	None

1.0 ppm = 1 mg/liter
2.2 mg sodium fluoride contains 1 mg fluoride ion.

D. Diet and Nutrition

Scientific and epidemiological data suggest a life long synergy between nutrition and the integrity of the oral cavity in health and disease.

Oral disease related to nutrition:

Dental caries
Periodontal disease
Caries and periodontal disease is exacerbated by diabetes mellitus.
Opportunistic infections and tumors in HIV infected individuals make eating difficult.
Oral and pharyngeal cancer

D. Sealants

Dental resins are applied to the pits and grooves of posterior permanent teeth to protect these hard to cleans susceptible areas from dental caries.

SECTION II

Oral Disease and Its Management

NEED FOR ORAL HEALTH

Oral health has greatly improved in the last half century. In 1940, a hallmark dental report noted, "This modern concept of preventive dentistry, in practice, must consist of service directed toward maintaining the health and increasing the life expectancy of teeth. It must look upon extractions as the mortician service that it actually is."[21] At that time prevention focused on the restoration of caries before they became deep enough to require pulp therapy or extraction. The etiology of dental caries and periodontal disease was not clearly understood, but as the causes of dental disease were illuminated true preventive measures could be instituted. We now know that caries is an infective disease. Further, we recognize the microorganisms involved in the process of caries, the chemical processes causing caries, and the nutritional ramifications of diet in contributing to caries. We also know how to prevent transmission of caries and what will control, and prevent caries infection. Treatment now goes beyond placing fillings to stop caries and prevent tooth loss.

The last 30 years have seen a decrease in the overall rate of caries although it remains disproportionately prevalent in low income, minority children and adults. Populations at increased risk for dental caries typically have a lower level of education, low income, and reduced access to dental insurance. Additionally, increased caries risk may come from race and ethnicity. While prevention of oral disease is preferred over treatment of dental problems, the dilemma today is inequity in individuals' ability to

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[21] Knutson JW, Klein H, and Palmer CE. Dental Needs of Grade School Children of Hagerstown, MD, JADA 27579-588, 1940.

access professional care. Currently, eight percent of children aged 2-5 years have 75% of the dental caries while 33% of children 6 years and older have 75% of the caries.[22] Lower socioeconomic status has been related to increased rates of dental caries.[23,24] This increased risk is associated with lack of access to care, reduced oral health aspiration, low self-esteem, and health behaviors that may advance caries risk.

TEETH AND SUPPORTING STRUCTURES

A tooth is composed of four components, enamel, dentin, cementum and the dental pulp. The bulk of the tooth is composed of dentin covered with enamel the hardest material in the body covering the portion of the tooth seen in the mouth. Cementum is a less calcified material covering the root. The fourth component is the dental pulp, containing vessels, nerves and connective tissue that supply nutrients to the tooth. The tooth is held in the bone of the jaw by periodontal ligaments (PDL), fibers that pass between the alveolar bone and the cementum of the tooth. (Fig 1)

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[22] Macek MD, Heller KE, Selwitz RH, Manz MC. Is 75 Percent of Dental Caries Really Found in 25 Percent of the Population? J Public Health Dent, 64:20-25, 2004.

[23] ____Community Water Fluoridation: A State Best Practice in Dental Caries Prevention. A Brief produced by the Association of State and Territorial Health Officials, Jan. 2003.

[24] Diagnosis and Management of Dental Caries Throughout Life. NIH Consensus Statement Online 2001 March 26-28, 2001 [2002, June 13]; 18(1):1-24.

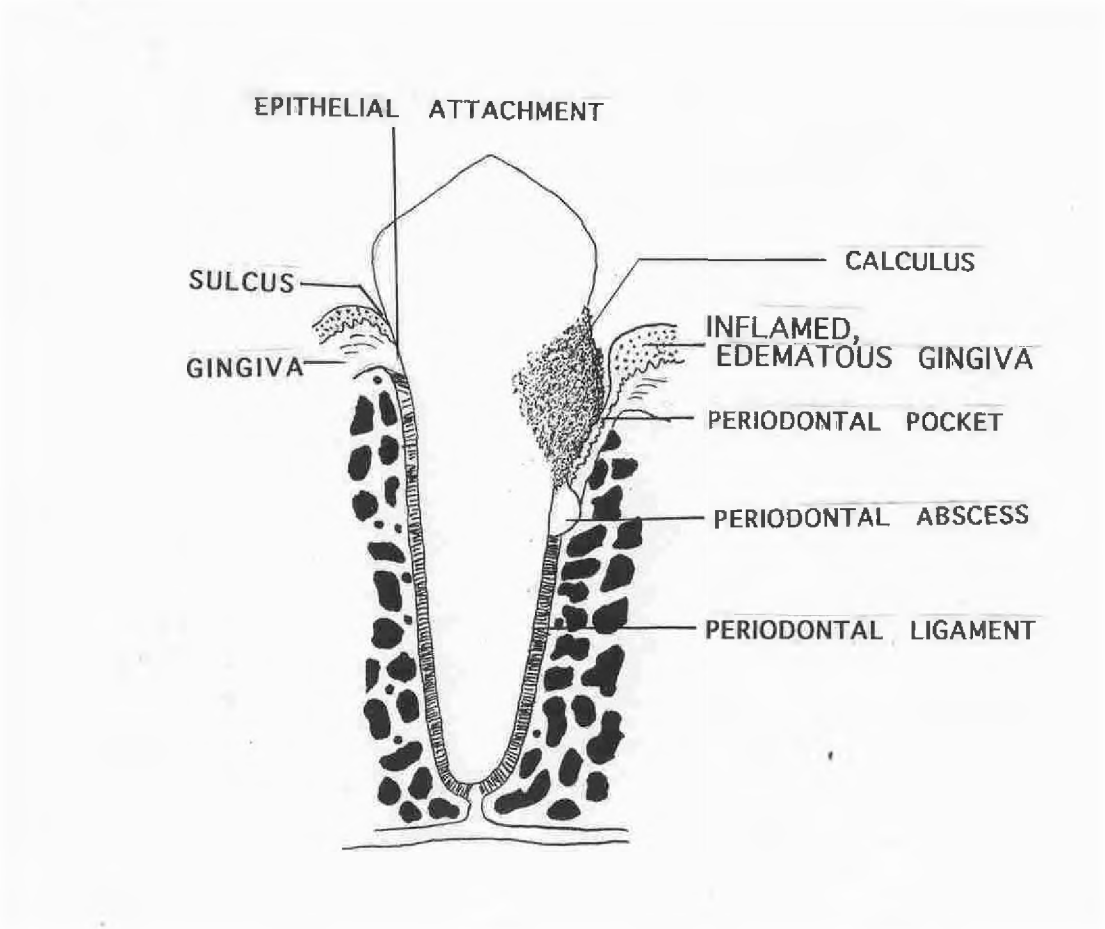


Figure 1 Tooth with healthy attachments (left) and Periodontal disease with calculus (right)

The tooth is the part of the body most resistant to destruction and is an important component in the identification of human remains. The enamel of the tooth in life is damaged or destroyed only by dental caries, dissolution with acid, or abrasion. The primary and permanent teeth are essentially the same structures except primary teeth are smaller with thinner enamel and minor differences in shape.

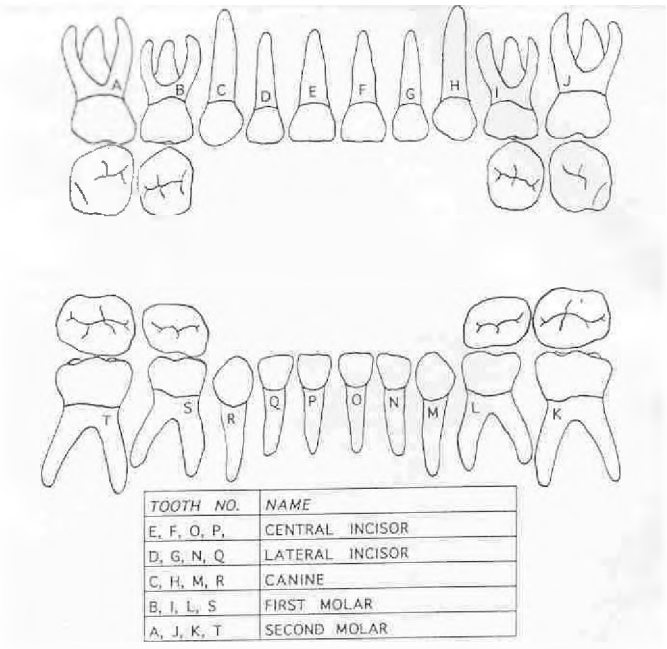


Figure 2 The Primary Dentition

PRIMARY DENTITION

The primary dentition of twenty teeth begins development in utero. The first primary teeth to erupt, the incisors, begin calcification about five months in utero and usually begin to erupt about six months after birth. The eruption of primary teeth continues until about two and a half years of age. (Table 1) Occasionally, a natal tooth is present at birth, or a neonatal tooth erupts shortly after birth. These teeth frequently have poor root formation and are extremely mobile, posing a risk of aspiration. The risk of aspiration to the infant or trauma to the mother during feeding should be assessed against the loss of space in the dental arch. (Fig 3)

Figure 3 Neonatal teeth on a newborn infant

Calcification of the permanent central incisors begins at about birth. (Table 1) The crowns of all of the permanent teeth are completely calcified by about eight years of age, with the exception of the third molars (wisdom teeth) that are calcified by about age sixteen. Starting around six years of age, the primary dentition begins to be exfoliated and is eventually replaced by the permanent dentition.

Calcification and Eruption of the Human Dentition

AGE in MONTHS	-5	-2	0	6	9	12	18	24	36	48	60	72	84	96	108	120	132	144	180	252
Primary Central	C	C	C	E			RC													
Permanent Central				C	C	C	C	C	C	C			E			RC				
Primary Lateral	C	C	C	C	E		RC													
Permanent Lateral					C	C	C	C	C	C	C			E			RC			
Primary Cuspid	C	C	C	C			E			RC										
Permanent Cuspid				C	C	C	C	C	C	C	C	C	C				E		RC	
Primary 1st molar		C	C	C	C	C	E		RC											
Permanent 1st Bi								C	C	C	C	C				E			RC	
Primary 2nd molar				C	C	C	E		RC											
Permanent 2nd Bi									C	C	C	C	C				E		RC	
Permanent 1st molar				C	C	C	C	C	C			E			RC					
Permanent 2nd molar									C	C	C	C	C	C				E	RC	
Permanent 3rd molar															C	C	C	C	C	E RC
AGE in YEARS	-.4	-.16	0	.5	.75	1	1.5	2	3	4	5	6	7	8	9	10	11	12	15	21

C= calcification period for the crown of the tooth
E=eruption The eruption is an average and may vary by a year or more. Teeth in the mandibular arch usually erupt before the maxillary arch.
RC=closure of the apex of the root which marks the completion of the development of the tooth.

From Schour, I. and Massler, M.

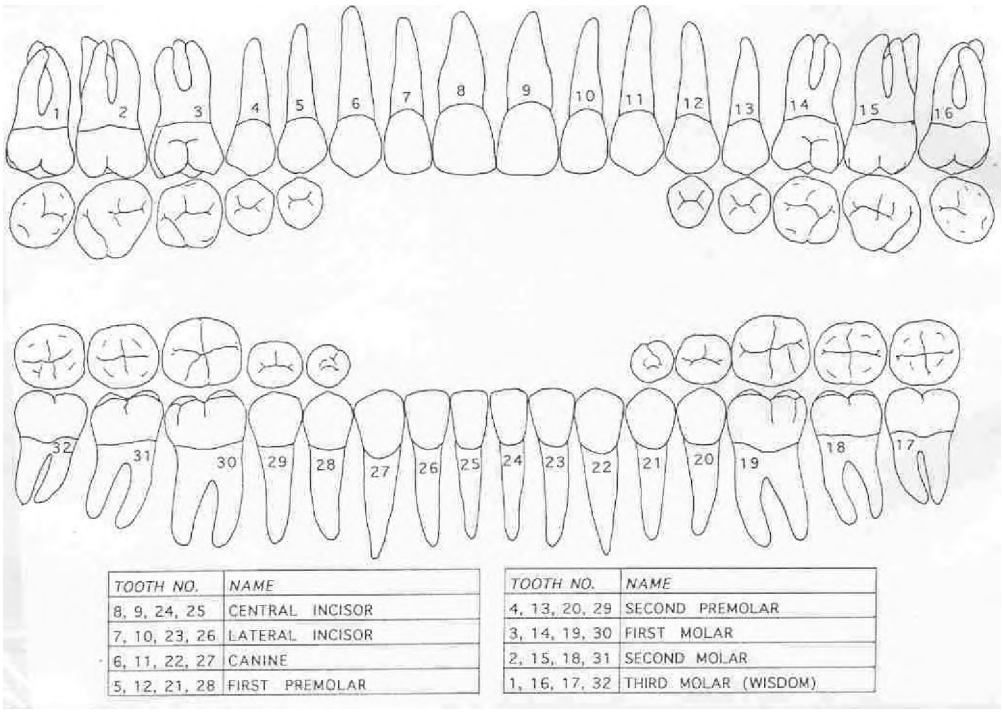
Table 1 Calcification and Eruption Sequence of the Primary and Permanent Dentition

PERMANENT DENTITION

The first permanent molars (six-year molars) erupt posterior to the primary molars and are sometimes mistakenly thought to be part of the primary dentition. Consequently, caries in the first permanent molars may be allowed to progress beyond restorability as they are believed to be "baby teeth" that will be lost.

By about twelve years of age, the primary teeth are all exfoliated and replaced by permanent teeth. However, delayed exfoliation may be associated with Job's syndrome, cleidocranial dysostosis, Down's syndrome, catatonic therapy, and oral radiotherapy.[25] There are twenty teeth in the primary dentition while the permanent dentition contains thirty-two, including the four wisdom teeth. (Fig 4) When there are fewer than the normal number of teeth for a child's age, radiographs should be taken to determine if these teeth have been extracted, are congenitally missing, or are unerupted.

[25] Holt R, Roberts G and Scully C. Oral health and disease , West J Med 174:199-202 2001.



TOOTH NO.	NAME
8, 9, 24, 25	CENTRAL INCISOR
7, 10, 23, 26	LATERAL INCISOR
6, 11, 22, 27	CANINE
5, 12, 21, 28	FIRST PREMOLAR

TOOTH NO.	NAME
4, 13, 20, 29	SECOND PREMOLAR
3, 14, 19, 30	FIRST MOLAR
2, 15, 18, 31	SECOND MOLAR
1, 16, 17, 32	THIRD MOLAR (WISDOM)

Figure 4 The Permanent Dentition

If there are unerupted (impacted) teeth, a determination should be made as to whether they should be orthodontically moved into place or removed.

DENTAL CARIES

Even with our knowledge of prevention, dental caries remain the most common chronic disease. The incidence of dental caries and preventive measures are related to socioeconomic conditions and education resulting in 20% of the population experiencing 60% of the dental caries. Only six percent of adults are caries free.[26]

Dental caries is a process of decalcification of tooth structure by acid formed from the fermentation of reducible carbohydrates by oral bacteria.[27] The acid is held in close contact with the tooth by plaque, a sticky gummy material constantly forming on the

[26] Slavkin HC. The Surgeon General's Report and special-needs patients: a framework for action for children and their care givers, Spec Care Dentist 21(3):88-94. 2001.
[27] Wolinsky LE in Newman MG and Nisengard R Oral Microbiology and Immunology W.B. Saunders Co, Philadelphia, 1988, pp. 389-409.

teeth. Plaque is composed of bacteria, bacterial products, food debris, and substances from the saliva.

Saliva is the first line of defense against caries as it dilutes and neutralizes the acid produced by cariogenic bacteria. **When the capacity of saliva to dilute and neutralize the acid is overcome caries progresses.** A decrease in the volume of saliva or increase in viscosity impairs its ability to cope with the acid. Saliva is supersaturated in respect to calcium and phosphate and can remineralize some decalcified tooth structure. Additionally, the incorporation of fluoride into the enamel as fluoroappite decreases the solubility of the enamel to acid and reduces caries. When decalcification of the tooth exceeds the rate of remineralization, the result is dental caries. Some conditions contribute to the risk of dental caries such as lack of adequate oral hygiene, excessive ingestion of fermentable carbohydrates, medication with saliva inhibiting pharmacological agents, radiation therapy to the head and neck, and other mechanisms that reduce the flow of saliva. Long-term exposures to cariogenic oral medications such as pediatric syrups that contain glucose, fructose or sucrose may also contribute to caries risk.

Caries first appears as a dark or brown spots in pits and grooves of molars depending on the staining potential of the diet or as chalky white spots on smooth surfaces. A breach in the continuity of the tooth, particularly in the pits and grooves with stain or graying internally, indicates caries (Fig 5).

Figure 5 Dental caries in the occlusal surface of tooth #5. Note stain in the grooves on the occlusal of Tooth # 4.

ASSESSMENT OF CARIES RISK

Risk assessment is essential for the proper management of dental patients and is also essential to effective preventive dental practices. Risk assessment identifies individuals who are at increased risk for dental caries. The most consistent predictor for future dental caries in children and adults is a past history of caries and restorations. The greater the number of dental caries and restorations observed even in parents and siblings predicts a greater the risk for future dental caries. Oral hygiene education for all ages is the key to prevention.

Health care providers who perform well baby checks see children at an earlier age than their dentist counterparts. Consequently, **non-dental health care providers have the opportunity to provide preventive instruction and therapeutic measures to**

prevent or manage dental caries in very young patients. On the other age extreme, older patients are also seen more frequently by non-dental health care providers. Older patient may also be at increased risk because of many factors such as gingival recession exposing cementum, saliva inhibiting medications causing a relative Xerostomia, and decreased physical ability to perform adequate oral hygiene.

Inability to maintain good oral hygiene is an important factor for increased caries risk. Young children, the elderly, and those with physical or mental disabilities have particular difficulty maintaining good oral hygiene and may be entirely dependent on others for routine oral hygiene measures. Gingival recession common among older people exposes root surfaces that are less calcified and thus more susceptible to caries. Early Childhood Caries (ECC), formerly known as "baby bottle decay," is a pattern of dental caries seen in nursing or post nursing children. This condition is seen first as caries in the anterior teeth often extending to the posterior teeth or affecting the entire dentition. This is caused by lactose in dairy and breast milk or other liquids containing sugars that remain in the mouth producing acid when the child falls asleep while nursing

from bottle or breast. (Fig 7)

Figure 7 Early Childhood Caries with complete destruction of the anterior teeth

PREVENTION OF DENTAL DISEASE

Frequent plaque removal is essential for caries prevention.[28] Plaque removal may be accomplished on the exposed surfaces of the teeth through the use of a toothbrush. A soft bristled brush is applied to the teeth and gingiva at a forty-five degree angle to the side of the tooth so that bristles can clean the tooth and enter the gingival sulcus. The brush is moved in small concentric circles. Cleaning should start in one place and proceed in a regular uniform manner so that the entire dentition may be thoroughly cleaned.

[28] Mandel ID. The Plaque Fighters: Choosing a Weapon, JADA, 124:71-74, 1993.

Small children should be helped in their cleaning routine until about age eight and should be checked by an adult regularly after they start brushing on their own. Mechanical (battery operated) toothbrushes may be a great aid for those who do not have the dexterity or motor skills to brush with a manual brush.[29] Mechanical brushes are particularly helpful for the elderly and handicapped.

Some individuals have space between their teeth. Thais may be more common in children. More of these individuals' teeth can be cleaned with a toothbrush. However, normally brushing can reaches only about 85% of the tooth's surface and the brush cannot reach between the teeth. Dental floss is the technique of choice for cleaning between teeth. About 18 inches to 2 feet of floss is cut and wrapped around the middle finger of each hand so that only about half an inch is left between the index fingers. The small amount of floss between the fingers is necessary to work the floss between the teeth without a bowstring effect cutting or bruising the gingiva. Once through the contacts between the teeth, the floss is moved up and down on one side of the embrasure and then other side of the embrasure to clean both surfaces of the interproximal spaces. It is not enough to only pop the floss through the contact. The interproximal surfaces need to be rubbed to clean them. As one moves to each new interproximal space the floss should be advanced from one hand to the other presenting a new clean area of floss for each interproximal space. (Fig 8)

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[29] Warren PR, Ray TS, Caugini M and Chater BV. A practice-Based Study of a Power Toothbrush: Assessment of Effectiveness and Acceptance, JADA 131:389-494, March 2000.

TOOTHPASTE[30]

Toothpaste is not essential for cleaning the teeth as it is the brush that removes plaque. However, toothpaste does leave a pleasant taste and can provide the therapeutic benefit of fluoride. Toothpaste is abrasive and can cause wear on the teeth. Table 4 list the relative abrasivity of some toothpastes.

Relative Abrasivity of Some Toothpastes (high score more abrasive)

Toothpaste	**Score**
Aim	185
AHDC	51
Close Up	218
Colgate	68
Crest	106
Colgate TC	113
Crest TC	130
Mentadent	103
CloSYS II	53
Tom's of Maine	93

Table 4 Toothpaste Abrasivity

"Tooth wear of enamel and particularly dentin is enhanced by the combination of soft drink, erosion, and toothpaste abrasion. Enamel itself appeared resistant to erosions compared to dentin wear similarly more resistant to erosion than dentin. These data are supportive of advice to avoid tooth brushing immediately following the consumption of acidic beverages."[31]

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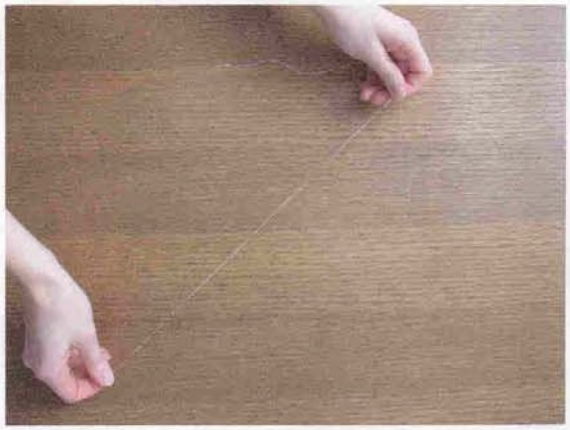
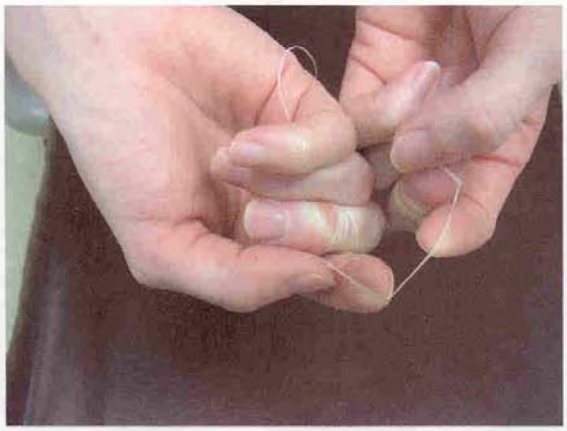
[30] Wynn RL, Meiller TF, Crossley HL. Drug Information Handbook for Dentistry, 7th Ed, Lexi-Comp, Hudson, 2001, p. 1362-1363.

[31] Hooper S, West NX, Pickles MJ, et al. Investigation of erosion and abrasion on enamel and dentin in model in situ using toothpaste of different abrasivity, J of Clinical Periodontology, 30(9):802, 2003.

Before flossing, wash your hands.



Cut a p;iece of floss about 18 to 24 inches in length.



Wrap floss around middle finger and leave about 1/2 inch between fingers.

Pass the floss through the contacts with care.

Work the floss up and down on each surface. Move to next tooth.

Use new floss for each interproximal. When done discard floss and wash

Figure 8 Flossing Technique

Mouthrinse

Mouthwash may be helpful in reducing and controlling plaque. Listerine™ an OTC product and chlorhexidine gluconate, a prescription product, may be helpful in controlling plaque.[32] Other mouthwashes may leave a pleasing taste, a fresh feeling, and sweeten the breath, but have less to contribute to plaque reduction or control.

Mouth guards

Mouth guards should be an essential part of contact sport equipment for children and adults. Most injuries to the teeth can be prevented if individuals wear mouth guards. Many kinds are available, butcustom mouth guards made by dentists are the most comfortable to wear.

Fluoride

Fluoride is an essential element in caries prevention. Fluoride provides a cost-effective, efficient means for preventing dental caries. Fluoridation of the community water supply is the easiest and most economical means of caries prevention. "Fluoridation is the single most important commitment a community can make to the oral health of its children and to future generations."[33] In non-fluoridated communities, oral daily fluoride supplement by prescription is the next most effective fluoride administration method. Fluoride may also be administered via rinse, topical fluoride application in custom trays, or brushing teeth with toothpaste containing fluoride. Recently, a fluoride varnish has been developed that can be painted on the teeth

[32] Barrett ML. The role of therapeutic antimicrobial mouthrinses in clinical practice: Control of supragingival plaque and gingivitis, JADA 134:699-704, June 2003.
[33] Dr. C. Everett Koop, U.S. Surgeon General, 1981-1989.

particularly, in young children. The advantages of fluoride varnish are: does not require special equipment; does not require a professional dental cleaning prior to application; is easy to apply; dries immediately upon contact with saliva; is safe and well tolerated by infants, young children, and individuals with special needs; is inexpensive and requires minimal training.[34,35]

Fluoride Supplementation Schedule

ADA Council on Scientific Affairs Recommendations for supplementation where water supplies are deficient in Fl.

AGE	Fluoride ion <0.3 ppm	level in drinki 0.3-0.6 ppm	ng water >0.6 ppm
Birth - 6 months	None	None	None
6 months - 3 years	0.25 mg/day	None	None
3 - 6 years	0.50 mg/day	0.25 mg/day	None
6 - 16 years	1.0 mg/day	0.50 mg/day	None

1.0 ppm = 1 mg/liter
2.2 mg sodium fluoride contains 1 mg fluoride ion.

Table 5 Fluoride Supplementation

PERIODONTAL DISEASE

Periodontal disease is an infection of the gingiva and supporting bone caused by bacteria in plaque on tooth surfaces.[36] The pathologic organisms in the dental plaque cause inflammatory reactions resulting in edema and hemorrhage and also produce cytokines that stimulate osteoclastic activity.[37] Calculus may also physically push the gingiva away from the tooth surfaces and present a rough surface that harbors micro-organisms and physically irritates the soft tissue and bone. Space develops between the

[34] Maternal and Child Health Bureau, HRSA. Fluoride Varnish Manual, Bureau of Family Health Services Maternal and Child Health, Carson City, Nevada, April, 2002.
[35] Weintraub JA and Hysan L. Fluoride varnish for caries prevention: comparison with other preventive agents and recommendations for a community-based protocol, Special Care Dentistry 23(5):180-186, 2003.
[36] Haake SK. Periodontal Microbiology, in Clinical Periodontology by Carranza FA and Newman MG, 8th Ed, W.B. Saunders Co., Philadelphia, 1996, p. 84.
[37] Mundy GR. Cellular and molecular regulations of bone turnover, Bone 24(5Suppl):35S-38S, 1999.

tooth and gingiva called a pocket and cause a loss of attached gingiva. (Fig. 1) The pocket is hard to clean and becomes a site of recurring infection unless there is intervention through home care or in severe cases professional care through chemical and surgical treatment. Periodontal disease is usually accompanied by malodor, and red, swollen, and hemorrhagic gingiva. Pressing on the gingiva or brushing will frequently produce bleeding. This indicates there is gingivitis and infection present. Good oral hygiene will usually resolve these symptoms in a couple of weeks, but continued inflammation and bleeding require professional consultation and treatment.

Treatment of periodontal disease consists of cleaning of the teeth, removal of calculus, curetting of pockets to remove infected tissue, oral hygiene education, and anti microbial therapy - systemic and local. Regular dental visits are needed to assess a patient's periodontal status, treat hot spots, and supervise compliance with preventive techniques. [38]

In recent years an association between periodontal disease and premature low birth weight infants has been found.[39,40, 41, 42] The exact mechanism of action is not currently known although two theories have been proposed: (1) Inflammatory products or mediators cause premature uterine contractions and early delivery[43, 44] and (2) micro-

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[38] Bauroth K, Charles CH, Mankodi SM, et al. The efficacy of an essential oil antiseptic mouthrinse vs. dental floss in controlling interproximal gingivitis, JADA 134:359-365, Mar 2003.
[39] Offenbacher s, Katz V, Fertik G et al. Periodontal infection as a possible risk for preterm low birth weight, Periodontol, 67(10 Suppl):1103-13, Oct. 1996.
[40] Jeffcoat MK, Geurs NC, Reddy MS, et al. Periodontal infection and preterm birth, JADA 132:875-880, July 2001.
[41] Lopez HJ, Smith PC and Gutierrez. Higher Risk of Preterm Birth and Low Birth Weight in Women with Periodontal Disease, JDent Res 81(1):58-63, 2002.
[42] Jeffcoat MK, Hauth JC, Geurs NC, et al. Periodontal Disease and Preterm Birth: Results of a Pilot Intervention Study, Periodontal 74(8):1214-1218, Aug 2003.
[43] Offenbacher S, Jared HL, O'Reilly PG, Wells SR. Potential pathogenic mechanisms of periodontitis associated pregnancy complications, Ann Periodontol 3(1):233-250, Jul. 1998.
[44] Lopez HJ, Smith PC and Gutierrez. Higher Risk of Preterm Birth and Low Birth Weight in Women with Periodontal Disease, JDent Res 81(1):58-63, 2002.

organisms cause uterine infection promoting early delivery.[45] Other researchers have made an association between periodontal disease and heart attacks.[46,47] Some reports indicate that micro-organisms or their inflammatory products may be contributing to coronary heart disease.[48]

Some research has shown an association between osteoporosis and periodontal disease. Regardless, it is important that individuals with osteoporosis pay particular attention to good oral hygiene and preventive measures because of the increased risk of periodontal disease and tooth loss.[49]

ORAL CANCER

All examinations of the oral cavity should include an oral cancer screening.[50] A thorough systematic examination includes observation of all of the oral structures and permits observations of abnormal tissue. Approximately two-thirds of head and neck squamous cell carcinomas present initially with advanced disease.[51]

The use of tobacco whether chewed or smoked increases the risk of oral cancer with a risk of developing squamous cell carcinoma of the head and neck that is 3 to 12 time greater for smokers over nonsmokers. Furthermore, the survival of never smokers

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[45] Madianos PN, Lieff S, Murtha AP et al. Maternal periodontitis and prematurity. Part II: Maternal infection and fetal exposure, Ann Periodontol 6(1):175-82, Dec 2001.
[46] Beck JD and Offenbacher S. The Association Between Periodontal Diseases and Cardiovascular Diseases: A State-of-the-Science Review, Ann Periodontol 6(1):9-15, Dec. 2001.
[47] Herzberg MC. Coagulation and Thrombosis in Cardiovascular Disease: Plausible Contributions of Infectious Agents, Ann Periodontol, 6(1):16-19, Dec. 2001.
[48] Geerts SO, Legrand V, Charpentier J, Albert A, and Rompen EH. Further Evidence of the Association Between Pperiodontal Conditions and Coronary Artery Disease, J Periodontal 75(9):1274-1280, 2004.
[49] Wactawwki-Wene J. Periodontal diseases and osteoporosis: Associations and mechanisms, Am Periodontol 6(1):197-208, 2001
[50] Depaola LG. Oral Cancer, Signs, Symptoms, and Recognition, NUMEDX 5(2):86-87, 106, 2004.SS
[51] Ovid de Bree R, Deurloo EE, Snow G, Leemans CR. Screening for Distance Metastases in Patients with, Head and Neck Cancer, Laryngoscope 110(3):397-401, 2000.

over ever smokers with squamous cell carcinoma is significantly different[52] This risk is compounded when combined with alcohol consumption of thirty or more drinks per week.

EXAMINATION OF THE ORAL CAVITY BY NON DENTISTS

A regular examination protocol promotes a more thorough examination. The oral examination begins with your observation of the total patient as the individual enters the exam room noting their general appearance, cleanliness, mobility, color, symmetry, coordination, demeanor, speech, eye contact, etc.

The oral cavity is a dark hole with a moving tongue that needs to be manipulated for a thorough examination. The necessary supplies and equipment are:

1. a good light source;
2. gloves to comply with OSHA standards and protection against cross infection;
3. a retractor such as a tongue blade or more ideally a dental mouth mirror that can be used as a retractor as well as a mirror to visualize areas that are otherwise difficult or impossible to see;
4. 2X2 gauge sponge to grasp the tongue to move it to examine its lateral boarders, base as well as floor of the mouth.

Starting with the face and lips, look for lesions, masses, change in color, texture, asymmetry, and scars. Open the mouth and observe and feel the inside of the lips and buccal mucosa looking and feeling for abnormal conditions. Next look at the teeth observing the number of teeth present, wear or abrasion, restorations, missing

[52] Pytynia KB, Grant JR, Etzel CJ, Roberts DB, Wei Q, and Sturgis EM. Matched-Pair Analysis of Never Smokers and Ever Smokers With Squamous Cell Carcinoma of the Head and Neck, J Clinical Oncology 22(19):3981-3988, 2004.

restorations, or dentures. Remove any dentures and look at the tissue under the dentures. The gingiva should be observed both buccally and lingually for color, indications of inflammation, edema, texture, and symmetry of the arch. Mobility of the teeth may be determined by pushing on them with a tongue blade or finger to check for movement. Healthy teeth should not show movement while periodontally involved teeth and some abscessed teeth will show movement. *It is particularly important that teeth be checked for mobility if an individual is to be subjected to oral intubation for general anesthesia.* Periodontally involved or loose teeth can be displaced or avulsed during intubation. Healthy gingiva is free from redness, edema, and should be pink in color with a stippled appearance like orange peel. The soft tissues of the floor of the mouth, tongue and pharynx should be examined, looking for ulcers, masses, or inflammation. All of the soft tissues need to be palpated by two fingers. Examination of the oral pharynx is accomplished by gently grasping the tongue with a sponge and pulling it forward. Examine the nodes of the head and neck. Finally have the patient close their teeth together to observe how their teeth occlude.

Tests:

Percussion: Tap lightly on a tooth with tongue blade or handle of a dental mouth mirror. Sensitive teeth may indicate traumatic occlusion, periapical or periodontal abscesses, or a cracked tooth.

Temperature: Much can be determined about the health of the pulp of a tooth by applying heat or cold to the tooth. Heat can be applied to the tooth with a cotton tip applicator heated with hot water. A severe and persistent reaction to heat indicates a necrotic pulp with gas gangrene present. Cold may be applied to the tooth with a piece of ice or a

cotton applicator soaked with ethyl chloride. A sudden severe response indicates an inflamed pulp. Prolonged discomfort after removal of the cold indicates an irreversible pulpitis. No reaction at all to cold may indicate a completely necrotic pulp or a severely calcified pulp chamber. Abnormal response to tests should prompt a dental referral.

DENTAL RADIOGRAPHS AND TREATMENTS RENDERED IN DENTAL OFFICES

Dental radiographs are an essential part of a complete dental examination for they permit visualization of the interior of the tooth and supporting structures. The three most commonly utilized dental radiographs are *bite-wings*, *periapical*, and *panographic*. Bite-wing radiographs show the crowns of the posterior teeth and are primarily utilized to detect dental caries (Fig 9). Periapical radiographs not only view the crown of the tooth but the root and supporting structures. (Fig 10) These radiographs are utilized to diagnose caries, periapical abscesses, and bone support. Panographic radiographs visualize the entire oral region on one sheet of film. (Fig 11) The panographic radiograph is primarily a screening film, to examine third molars, detect cysts, impacted teeth, view tempromandibular joints, caries, abscesses and fractures.

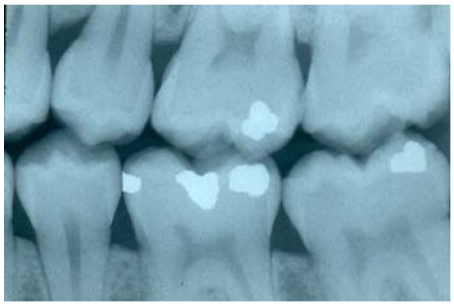


Figure 9 Bitewing Radiograph that shows the crowns of the teeth used to detect caries

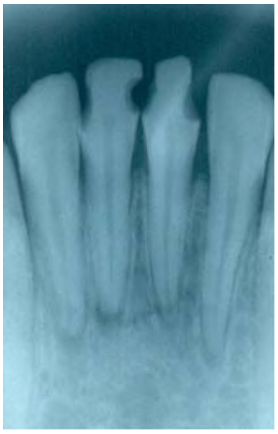


Figure 10 Periapical Radiograph that shows the roots and pathology of the supporting structures.

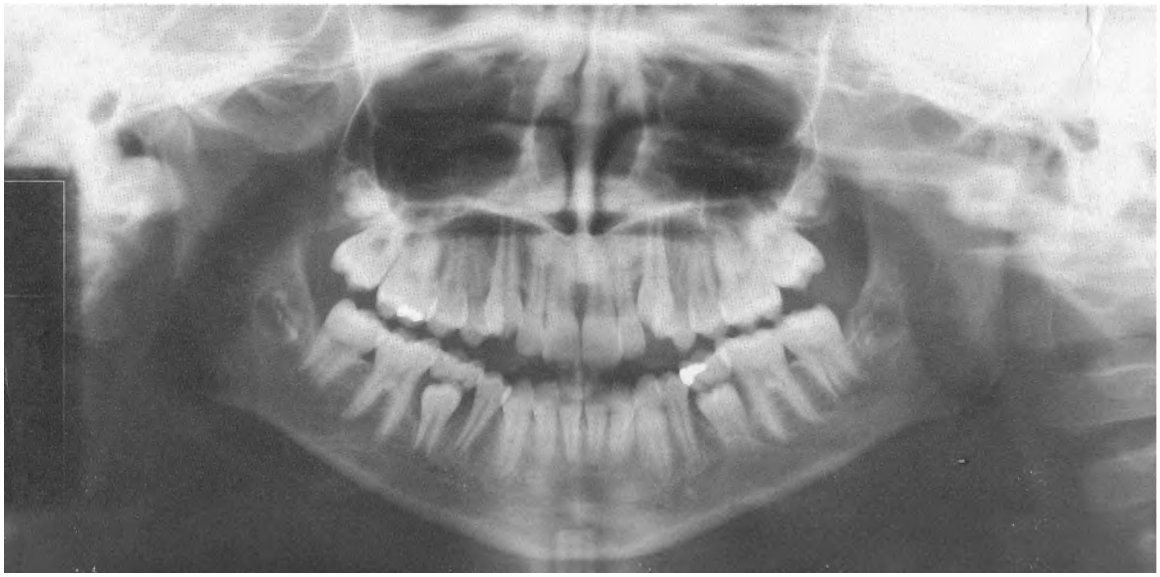


Figure 11 Panographic Radiograph

Some people have a fear of X-rays and an aversion to dental radiographs. The x-ray radiation a patient receives during the exposure of dental radiographs is very small. A 15 film full mouth survey of periapical radiographs using periapical D speed film with circular collimation at 70 KVP would be equivalent to 14 days extra natural background radiation exposure. Four bite-wing views would be equivalent to 5 days extra

background exposure. One panographic radiograph would be equal to three days of extra exposure.[53] Dental radiographs are usually taken with a lead apron on the patient. This additionally reduces X-ray exposure to the patient.

Other less frequently exposed views of the oral cavity are *occlusal radiographs* used to help locate the position of impacted teeth and sialoliths in the sublingual and sub mandibular salivary glands. Specialized *TMJ radiographs* are used to check the position of the head of the condyle of the mandible in the glenoid fossa. *Cephalometric radiograph*s are used to determine bony reference points and diagnosis of orthodontic conditions.

Digital radiographs are becoming more commonly used. This requires less patient radiation exposure for each view, but because of the size of some receptors and the need for more views total radiation may not be significantly reduced.

DENTAL CARE RENDERED IN DENTAL OFFICES

Dental Cleanings (Prophylaxis). Calculus, a hard calcified accretion, is formed when calcium and phosphate in a super saturated concentration in the saliva are precipitated into the matrix formed by dental plaque. The greatest accumulation of calculus is found on teeth closest the openings of the ducts from the major saliva glands located at the cheek side of the upper molars and the tongue side of the lower front teeth. Microscopically, calculus resembles coral and can physically irritate the gingival tissue. Calculus also harbors a mixture of microorganisms that can infect the gingiva. Calculus mechanically pushes the gingiva back contributing to the destruction of the attached

[53] White SC and Pharoah MJ. Oral Radiology, 4th Ed. Mosby, St. Louis, 2000, p. 49.

gingiva and helps form periodontal pockets. (Fig 12) Calculus also may absorb stains and appear as dark brown or black deposits. Before filter tip cigarettes most calculus on smoker's teeth was stained black from tobacco tar.

Figure 12 Calculus accumulated around the lower anterior teeth. Note also the open bite that may be a result of a thumb sucking or tongue thrust habit.

Some individuals collect considerable amounts of dental calculus. Calculus must to be mechanically removed with hand instruments or ultrasonic scalers. After the hard deposits are removed, teeth are polished to retard accumulation of additional deposits. If plaque is thoroughly removed by brushing and flossing before it becomes calcified (after about 24 hours) little if any calculus forms.

Amalgam Fillings: These serviceable metal restorations have been the most commonly utilized dental restorations over time. Amalgam restorations vary greatly in appearance. Older tarnished restorations may appear nearly black compared to gray for newly placed

unpolished restorations. Polished amalgam restorations have a bright silver appearance. (Fig 13)

Figure 13 Silver Amalgam Restorations

Composite: This restorative material has become very popular in replacing amalgam as a posterior tooth restoration because of its superior esthetics. These resin fillings can be matched to the color of the tooth and may be indistinguishable from tooth structure making them hard to recognize. However, composites may not have as long a service life as amalgam. (Figs 14, 15)

Figure 14 Fractured central incisor.

Figure 15 Fracture restored with composite resin

Porcelain: Porcelain is nothing more than fused glass be fabricated into inlays, veneers, and crowns. These life-like restorations may be hard to see. Porcelain may also be fused to the surface of metal to make metal cast restorations more esthetic. Metal backing gives additional strength to porcelain fused to metal restoration over plain porcelain. (Fig 16)

Figure 16 Porcelain fused to metal crowns have been placed on the four incisor teeth

Gold: Gold restorations are distinctive because of their color. Because of esthetics, gold is not used as a restoration as frequently as in the past. These serviceable restorations maintain their appearance and integrity for many years. (Fig 17)

Figure 17 Teeth restored with gold inlays

Sealant: Sealants are resins placed in the pits and grooves of permanent posterior teeth usually soon after the eruption of the teeth. The resin seals the pits and grooves to

prevent the development of dental caries in these hard to clean susceptible areas. The resin appears clear, tinted, or as opaque spots in the pits and grooves in the posterior teeth. Dark staining around the edges of sealants may indicate their failure and should be checked to determine if replacement is necessary. (Fig 18)

Figure 18 Sealant on the occlusal surface of the last tooth

Prosthetic Appliances

Replacement of teeth: Teeth may be replaced by several techniques usually classified as fixed (crown and bridge) and removable (full and partial dentures). Fixed prostheses are permanently cemented in place and are not removed for cleaning. They must be cleaned along with natural teeth through routine oral hygiene. Removable appliances are prostheses that can be removed for cleaning. Patients, particularly with full or complete dentures, should be checked regularly for fit of the dentures, loss of vertical dimension (space between the upper and lower jaws), and health of the tissue on which the dentures rest.

Implants: Implants are a relatively new technique for replacing missing teeth or stabilizing dentures. Implants are titanium screw posts surgically placed in the alveolar ridges of the jaws. After integration into the bone, crowns are placed on the implant to replace teeth or attachments may be placed to retain and stabilize dentures.

Habit Appliances: Bite planes may be made to prevent grinding of teeth, increase vertical dimension, or take the stress off teeth or temporomandibular joint. Oral appliances for the correction of some oral habits such as thumb sucking and tongue thrusting may also be constructed. (Fig 19)

Figure 19 This dental arch has been distorted by the habit of sucking on a finger

Oral appliances may be made to correct or alter snoring and sleep apnea. The majority of the sleep disorder appliances function by advancing the mandible and opening the air passage

Cosmetic Dentistry

As public focus on improving appearance increases, dentistry has contributed by improving smiles. Orthodontics can be employed to improve a smile by correcting

uneven teeth, malocclusion, and malfunctioning bites. Teeth can be made whiter through bleaching techniques. The shape of teeth can be improved through utilization of crowns and veneers. Veneers are thin layers of porcelain placed on the lip surface of the front teeth that have had a portion of the enamel removed to accommodate the porcelain for esthetic reasons. Crowns essentially replace the enamel of a tooth with metal, porcelain, resin, or a combination of these materials.

EATING DISORDERS

Frequently chronic bulimia or "binge-purge syndrome" can be diagnosed by observing tooth destruction. The tongue side of the dentition has tell-tale smooth enamel and dished out dentin when the enamel has been penetrated. For some, the enamel may be completely destroyed by the highly acidic vomit.[54, 55] Tooth surfaces affected by the vomitus may be sensitive to hot and cold. If there are fillings, the restorations may appear to be growing out of the tooth. Hiatus hernias or Gastroesophageal Reflex Disease (GERD) may also result in destruction of tooth structure for the same reason as bulimia, acidic gastric secretion dissolution of the enamel.[56] (Fig 20)

[54] Rytomaa I, Jarvinen V, Kanerva R, Heinonen OP. Acta Odontol Scand. 56(1):36-40, 1998.
[55] Christensen GJ. Oral Care for patients with bulimia, JADA. 133:1689-1691, Dec. 2002.
[56] Ettinger R. GERD – a silent disease, Spec Care Dentist 23:197-198, 2003.

Fig. 20 Destruction of the lingual enamel on this bulimia patient

XEROSTOMIA

Someone said saliva is the liquid of the quality of life. Saliva keeps the mouth comfortable, facilitates swallowing, aids in speech, starts digestion of food, and protects against infection. Dentures do not fit or function well without it. It is hard to chew and swallow without saliva. Saliva protects the oral mucosa and has anti-infective properties. One of the most important functions of saliva is to protect the teeth. Saliva neutralizes or dilutes acid formed in the caries process protecting the tooth against decalcification. As saliva is super saturated in respect to calcium and phosphate, it protects the teeth against their slow dissolution in the fluid of the mouth. The quantity of saliva may be reduced by several mechanisms such as drugs and radiation. The amount and quality of saliva also diminishes with age. Many drugs (Table 7) can reduce the flow of saliva. Most of these

drugs have anticholinergic properties. Some compounds such as caffeine and diuretics may cause a decrease in salivary flow by increasing urine output and causing relative dehydration.

Medications Decreasing Saliva[57, 58]

CATEGORY	GENERIC NAME	TRADE NAME
Anticholinergic Agents	atropine	Atrohist, Lomotil
	belladonna	Donnatal, Respa-A.R.M.
	benztropine	Cogentin
	oxybulynin	Deitropan
	scopolamine	Transderm Scop
	trihexyphenidyl	Artane
Antiacne Agent	isotretnoin	Accutane
Antidepressant and Antipsychotic Agents		
Selective serotonin-reuptake inhibitor	citalopram	Celexa
	fluoxetine	Prozac
	paraxetine	Paxil
	sertraline	Zoloft
	venlafaxine	Effexor
	amitriptyline	Elavil
Tricyclic antidepressant	desipramine	Norpramin
	imipramine	Tofranil
Heterocyclic antidepressants	haloperidol	Haldol
	mirtazapine	Remeron
	pimozide	Orap
Monoamine oxidase inhibitor	phenelzine	Nardil
Atypical antidepressants	bupropion	Wellbutrin, Zyban
	nefazodone	Serzone
	olanzapine	Zyprexa
Diuretic Agents	chlorothiazide	Diuril
	furosemide	Lasix
	hydrochlorothiazide	HydroDiuril,
	triamterene	Dyrenium
Antihypertensive Agents	captopril	Capoten
	clonidine	Catapres
	clonidine/chlorthalidone	Combipres
	enalapril	Vasotec
	guanfacine	Tenex
	lisinopril	Zestril
	methyldopa	Aldomet
Sedative and Anxiolytic Agents	alprazolam	Xanax
	diazepam	Valium
	flurazepam	Dalmane
	temazepam	Restoril
	triazolam	Halcion
Muscle Relaxant Agents	cyclobezaprine	Flexeril
	orphenadrine	Norflex
	tizanidine	Zanaflex
Analgesic Agents CNS/opioids	codeine	(generic)

[57] Wynn RL, Meiller TF and Crossley HL. Drug Information Handbook for Dentistry, Lexicomp, Hudson, 9th Ed. 2003, p. 1561

[58] American Dental Association. Dental Therapeutics, R.R.Donnelley & Sons Co., Chicago, 2nd Ed., 2000, p. 518-525.

NSAI agents	meperidine methadone pentazocine propoxyphene tramadol diflunisal ibuprofen naproxen piroxicam	Demerol Dolophine Talwin Darvon Ultram Dolobid Advil, Motrin Aleve, Naprosyn Feldene

Table 7 Agents that cause Dry Mouth

Salivary glands exposed to radiation therapy have damage that results in a permanent reduction or complete lack of saliva secretion. When there is a reduction in the flow of saliva there is an increase in susceptibility to caries that may result in rapid rampant caries. In some cases the entire crowns of teeth may be destroyed by caries in as little as six months time.

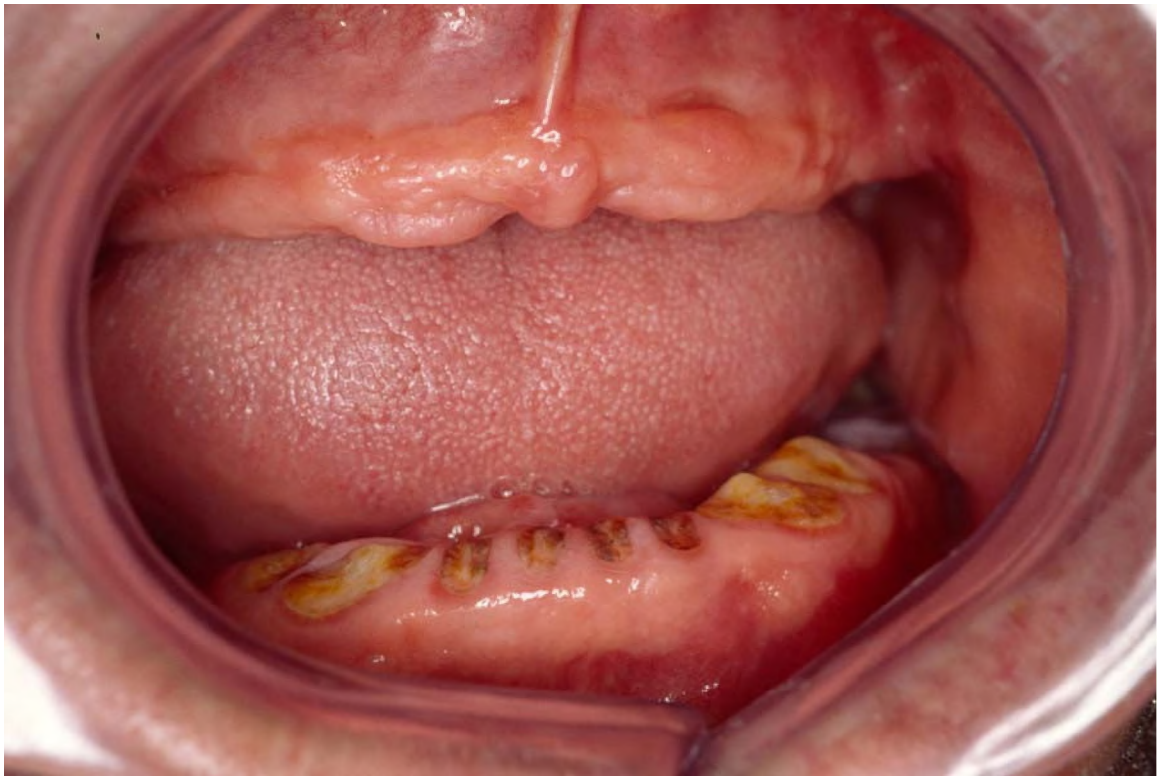


Figure 21 Radiation caries nine months following completion of radiation therapy to the oral region.

In addition to routine preventive techniques, prevention of caries from diminished saliva may require fabrication of trays to apply a daily high concentration fluoride solution to the teeth. For radiation patients at high risk for dental caries, extraction of all remaining teeth may be recommended to prevent the need of extraction and the resulting possible complication of osteoradionecrosis.

ATTRITION

Some people have the habit of grinding their teeth. Continual grinding, particularly in the presence of air containing dust or grit, may cause considerable damage to the dentition. In extreme cases the greater portion of the teeth may be ground away causing the loss of vertical dimension, less attractively proportioned teeth, and pulp exposure. Dental consultation for these cases is needed to evaluate treatment and prognosis. Other causes of tooth destruction may include dissolution of the enamel with low pH substances such as extreme citrus consumption and sucking vitamin C tablets, and excessive wine consumption.[59, 60] (Fig 22)

[59] Mandel L. J Am Dent Assoc, 136(4):438-440, 2005.
[60] Wiktorsson AM, Zimmerman M, Angmar-Mansson B. Eur J Oral Sci, 105(6):544-550, 1997.

Figure 22 Loss of enamel along the gingiva from sucking lemons

DRUG INDUCED GINGIVAL GROWTH

Some calcium channel blockers, anti-rejection drugs, and anti-seizure medications may stimulate the growth of the gingiva. (Table 8) In individuals experiencing excessive gingival growth, consideration should be given to changing medications or periodic surgical gingival recontouring. Untreated gingival hyperplasia promotes periodontal disease and periodontal pockets. (Figs 23,24)

Medications Producing Gingival Hyperplasia

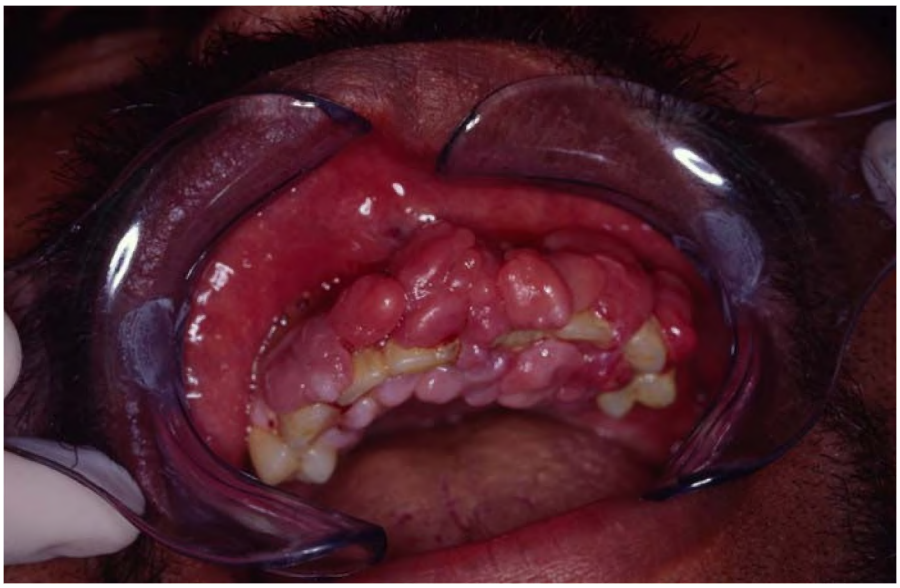
AGENT	GENERIC NAME	BRAND NAME
CALCIUM CHANNEL BLOCKERS	amlodipine	Norvasc
	bepridil	Vascor
	diltiazem	Cardizem, Dilacor
	felodipine	Plendil
	isradipine	DynaCirc
	nicardipine	Cardene
	nifedipine	Adalat, Procardia
	nimodipine	Nimotop
	verapamil	Calan, Isoptin, Verelan

ANTICONVULSANT AGENTS	phenytoin	Dilantin
IMMUNOSPUPRESSIVE AGENTS	cyclosporine	Neoral, Sanimmune, Gengraf

61, 62

Table 8 Agents that Promote Gingival Hyperplasia

Figure 23 Phenytoin Hyperplasia



[61] Wynn RL, Meiller TF, Crossley HL. Drug *Information Handbook for Dentistry*, 9th Ed. Lexcomp Inc., Hudson, 2003, p. 1598-1599.

[62] American Dental Association. Dental Therapeutics, R.R.Donnelley & Sons Co., Chicago, 2nd Ed., 2000, p. 511.

Figure 24 Cyclosporine Hyperplasia

DIABETES

Diabetes is a risk factor for the development of periodontal disease. Patients with this condition have a higher incidence of periodontal disease.[63] Increased rate of periodontal disease in diabetics may be the result of small blood vessel changes in the gingival tissue and increased glucose levels in the gingival fluids.[64] Diabetics may find it more difficult to maintain control of their diabetes in the presence of infection.[65] Severe periodontal disease may affect a patient's control of diabetes. Additionally, diabetics do not heal as rapidly and have more complications from dental procedures.

NUTRITION

The body needs appropriate nutrition to provide the building blocks for growth and development. A functioning dentition is necessary for optimal nutritional intake and "Numerous studies have found that fewer remaining teeth, edentulism, poorer mastication function, and other oral problems are associated with decreased nutrient intake."[66]

It is the position of the American Dietetic Association that, "nutrition is an integral component of oral health. … Scientific and epidemiological data suggest a life

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[63] Shlossman M, Knower WC, Pettitt DJ, and Genco RJ. Type 2 diabetes mellitus and periodontal disease, JADA 121:532-536, Oct 1990.
[64] Little JW, Falace DJ and Genco RS. Dental Management of Medically Compromised Patients, 6th Ed. Mosby Co., St. Louis, 2002, p. 267.
[65] U.S. Department of Health and Human Services. Periodontal Disease and Diabetes: A Guide for Patients, NIH Publication No. 87-2946, September 1987.
[66] Marshall TA, Warren JJ, Hand JS, et. al. Oral health, nutrient intake and dietary quality in the very old, JADA, 133:1369-1379.

long synergy between nutrition and the integrity of the oral cavity in health and disease."[67]

Sugar content of some common foods

Food	Amount	Teaspoons Sugar
Angle food cake	1/12	6
Apple pie	1/6 of med. Pie	14
Apricots, dried	4-6 halves	4
Brownies	2 X 2 X ¾	3
Chewing gum	1 stick	½
Chocolate cake	1/12 2 layer	15
Chocolate cream	13 gms	2
Chocolate milk	8 ounces	6
Coke®	6 ounces	4 ½
Dates, dried	3-4	4 ½
Doughnut, plain	3 inch	4
Ginger ale	6 ounces	3 ½
Grape juice	6 ounces	6
Hershey® bar	60 gms	7
Honey	1 tablespoon	3
Jelly	20gms	3
Lifesaver®	1	½
Orange juice	6 ounces	3
Raisins	¼ cup	4
Sweet cider	6 ounces	4 ½

Table 9 Sugar content of some common foods

ORAL TRAUMA

Trauma to the mouth should be considered a true emergency. Avulsed teeth constitute emergencies, but may be successfully salvaged if treated within an hour after an accident. An avulsed tooth needs to be kept moist. Ideally, an avulsed tooth should be placed in Hank's balanced salt solution until re-implantation. An avulsed tooth should not be rubbed, or scraped. These actions damage the periodontal fibers and the

[67] The American Dietetic Association, J Am Diet Assoc, 103(5):615-625, 2003

cementum and cause root resorption. The tooth may be gently rinsed to remove debris. Alternatives to Hank's solution for keeping the tooth moist include are placing the tooth in milk or keeping it in the mouth if the individual is capable of doing so without swallowing or aspirating it.

Displaced teeth need to be repositioned in proper occlusion. If there are fractures of the alveolar process, it is sometimes necessary to expose the fractured area and remove bone particles that may keep the fragments from returning to their normal position. It is recommended that avulsed primary teeth not be re-implanted.

Whenever there is a trauma to a tooth, it is common for the tooth to have its blood supply interrupted or edema in the pulp chamber that may cause an interruption of the blood supply resulting in death of the dental pulp.[68] Necrosis of the pulp is treated with either a root canal or an extraction. Blows to the teeth should be evaluated for base line information and possible treatment. Follow-up is needed to evaluate the health of the dental pulp. Necrotic dental pulp results in considerable apical bone destruction, sometimes without symptoms and or recurrent infection.

Teeth that are fractured with pulpal exposures also need immediate attention and treatment in order to possibly maintain the vitality of the dental pulp and minimize discomfort. As an emergency measure, cyanoacrylate (super glue) may be applied to the fractured area to offer some protection.

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[68] Aldous JA, White GL, Smith AJ. Traumatic Injuries to the Dentition, Physician Assistant 14(5):117-125, 1990.

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